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INSTALLING THE HSG SOFTWARE

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This paper describes the steps required to install HSG software on a Sun workstation. Although the technique has only been tested on a SUN workstation, it will probably work for any UNIX system. The instructions assume that the user has familiarity with the commands required for administration of UNIX and ARC/INFO.
There are two main segments to HSG software. The first is the wood supply simulation program and related tools, as described by Moore (1990). The second is a prototype decision support system linking the HSG model to the ARC/INFO GIS software.

Throughout these instructions the following conventions are used. Prompts presented by the computer system are displayed in a bold Courier font (e.g. **passwd:**). Responses to be typed in by the user are displayed in a plain Courier font (e.g. `cd /hsgdir/sample/runs`).

Installing the HSG model

1) Ensure that there is sufficient disk space to install the software. About 20 mb is required.
2) The software may be installed under any directory path. Change to the directory where the software is to be installed.
   e.g. `% cd /disk2/wood`

3) Copy files off of the QIC tape using the following tar command:
   ```
   % tar -xf /dev/rst8
   ```

4) The installation directory should now contain an additional subdirectory named 'hsgdir'. Verify the space taken up by the files using the du command. The new hsgdir subdirectory should contain about 10mb.

5) Add a symbolic link to point from the root to this new subdirectory. This step requires super-user privilege.
   ```
   % su root
   # cd /
   # ln -s /disk2/wood/hsgdir hsgdir
   # exit
   ```

Note:	Exit ensures that the user exits from super-user mode. This is essential.

6) Modify the .cshrc scripts for the accounts that will be using the software. Add the following lines to the appropriate location in the .cshrc file.
   ```
   set path=($path /hsgdir/bin)
   setenv HSGDIR /hsgdir/bin/
   ```

Note:	You must logout and login again to have these changes take effect.

7) Recompile the software if required. Binary executables have been distributed on the tape; however, recompilation may be required if the operating system is not compatible with SunOS™ version 4.1. This process is assisted through the use of the following 'makefile' scripts.
   ```
   % cd /hsgdir/source
   % make clean
   % make compile
   % make install
   ```

Note:	In order to compile the HSG software the target workstation must have UNIX program development tools installed. If not located on the workstation, this optional software can be found on the SunOS™ distribution tape.

Note:	After the software has been installed the 'make clean' command can be used to reclaim disk space occupied by unnecessary files.

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At this stage the software installation is complete. A set of test data have been provided with the tape. The following commands can be used to test the software and verify that it is installed correctly. Refer to Moore and Lockwood (1990) for a complete description of HSG commands.

```
% cd /hsgdir/sample/runs
% hsg < basic.act > basic.sum
% subset -i 'YEAR:TYPE=volume:STATUS=hrvt:SPECIES'\
< basic.sum | sunchart
% subset-i'YEAR:SPECIES:TYPE=volume:STATUS=hrvt:AGE'\
< basic.sum | sunchart
```

Installing the Forest Management Planning decision support system

The decision support system is a set of AML tools which drive the HSG and ARC/INFO software. ARC/INFO version 5.0 or later is required for use of these scripts. The following steps are required to install the software:

1) Modify the .cshrc scripts for the user accounts that will be using the software. Add the following line to an appropriate location in the .cshrc file.

```
alias archsg'arc \&run /hsgdir/ aml/fmis'
```

2) Add a record to the master ARC/INFO library table to include a pointer to the sample library database using the following procedure:

```
% su root
password:
# cd /arcexe50/tables
# info
ARC
SELECT LIBRARY.DATA
ADD
NAME> IROQUOIS
LOCATION>   /HSGDIR/SAMPLE/
DATABASE
NAME>
QUIT STOP
# exit
```

Note:	Exit ensures that the user exits from super-user mode. This is essential.

3) Update the sample database to allow "manager access" by authorized user accounts. Initially you must add the name of the account installing the software.

```
% cd /hsgdir/sample/ database/info
% info
ARC
SEL MANAGERS
ADD
NAME> bob
NAME>
QUIT STOP
```

4) Make sure the external file pointers within the sample library point to the correct locations.

```
% cd /hsgdir/sample
% arc
Arc: librarian
Librarian: library iroquois
Librarian: visit arc externalall
Librarian: quit
Arc: quit
```

Installation of the Forest Management Planning decision support system software is complete.

Using the Forest Management Planning decision support system

This section provides a brief guide to the functions and capabilities provided in the prototype Forest Management Planning decision support system (DSS). The DSS provides a set of tools for generating, manipulating, and analyzing timber harvest schedules. The order in which the tools are selected for use depends entirely on the problem at hand. While this section provides a brief tutorial on the use of the tools, any "real" application of the DSS will depend on the problem under consideration and may require further development of the toolkit.

A test dataset has been provided with the distribution tape (supplied). The DSS operates on a workspace which contains HSG input parameter files and output summary files. Many files will be created and removed in the archsg workspace as the system operates, so this directory should not contain any files of value. To invoke the DSS on the sample data, issue the following commands:

```
% cd /hsgdir/sample/runs
% archsg
```

Caution:	This DSS creates and manipulates an info subdirectory in its current workspace. Do not use this system in a workspace which already contains an info subdirectory, such as a workspace containing ARC/INFO coverages. Data stored in the existing info subdirectory will be destroyed! Check with your systems administrator if you are uncertain about the meaning of this restriction.

Note:	Before starting the ARCHSG system, move the current shell window to the bottom left corner of the screen to prevent it from being obscured by the ARC graphics window.

The ARC/INFO system will start and a hardware selection menu will be displayed. Press

9 to indicate that a Sun workstation console is being used.

The system will present a database selection menu. The Iroquois Falls dataset is a sample of 12 mapsheets taken from the Iroquois Falls forest management unit in Northern Ontario. This dataset has been provided courtesy of Abitibi-Price Inc and the Ontario Ministry of Natural Resources. Use the mouse to move the cursor over the "Iroquois Falls" selection and press the mouse button on the right.

The graphics screen will be divided into three sections, with a white box drawn around each. Legend information, when required, will be drawn in the top right box. An index grid will be drawn in the bottom right box. The red lines indicate the extent of the Iroquois Falls FMU database. The green lines indicate the sample mapsheets that have been distributed on the HSG tape. Use the mouse to move the pointer to a location within a green square, and press the right mouse button. This action will designate the area within the database that should initially be drawn upon the screen. A small white box will be drawn on the index grid to indicate the selected area.

The forest inventory data for the selected area will be drawn within the large box on the left half of the screen. The initial map will have polygon boundaries drawn in green, stand labels in white, and roads and streams drawn with the appropriate symbology.

After the initial map has been drawn upon the screen a pulldown menu will appear in the top left corner. The pulldown menu has six categories of commands. To select a category, use the mouse to move the cursor over one of the keywords and then press the right mouse button. The following sections will describe each of the categories.

CONTROL

The control menu provides basic functions, such as refreshing the screen, quitting the program, or producing a hard copy map. The 'hard copy map' option is currently set up to send Postscript output to the default system printer. Do not select this option unless you have a Postscript printer established as your default printer.

ROAM

Commands within the 'ROAM' menu are used to navigate around the database. Each of the ROAM sub-commands causes the small white square to move around the reference grid. As the square is moved, the information in the large display panel is updated to reflect the newly selected area. Most of the sub-commands take effect as soon as they are chosen (e.g. zoom, pan, scale). The 'move by pointing' commands require that the user select a point with the cursor, and 'scale 1:?' requires that the user enter a numeric value. As soon as a ROAM sub-command is selected the screen will be updated to draw the newly selected area.

THEMES

The THEMES menu controls the presentation of thematic information on the screen. The top half of the THEMES menu contains toggles. For example, stand boundaries may be toggled on, in which case they would be display in conjunction with any other selected theme. Toggling an option will have no effect until the screen is redrawn. The middle half of the THEMES menu contains choropleth mapping commands. Only one of these options may be selected at a time. As soon as a choropleth option is chosen the screen will be redrawn using the currently selected mapping options.

MEASURE

The MEASURE menu contains some simple map coordinate tools. The WHERE sub-command will change the cursor from an arrowhead to a cross-hair. After the left mouse button is pressed the GIS will determine the UTM location of the cross-hair. The LENGTH sub-command will determine the length of a line traced with the cross-hair. The left mouse button is used to mark intermediate points along the line being traced. Pressing the combination of the control key and the right mouse button terminates the line being entered and displays the line length. The AREA command operates in a similar manner to the LENGTH command. IDENTIFY locates a forest stand polygon and displays information from the polygon attribute table.

SELECT

The SELECT menu provides a means to adjust the set of selected polygons. Whenever the screen is readjusted using the ROAM command the system automatically selects the set of visible polygons. Commands within the SELECT menu can be used to add or remove polygons from the selected set. Other commands (such as those for preparing reports or modifying data layers) operate only on the polygons within the selected set.

WOOD SUPPLY

Use 'Wood Supply' menu to gain access to the HSG model. The Wood Supply menu is hierarchical: each sub-command within this menu contains another series of sub-choices.

Running the HSG model

The first sub-command menu, 'Select scenario', provides commands to manipulate the HSG activity files. The activity files contain parameters which control the wood supply model. The 'Choose activity file' causes the system to display a dialogue box which has an input field for the file name. Like most dialogue boxes, a menu of choices can be obtained by locating the cursor within the input field and pressing the middle mouse button. At this point a matrix menu of possible choices will appear. Use the right mouse button to select a choice (use 'BASIC.ACT' the first time), and then click on the 'OK' button to confirm that choice. After an activity file has been chosen, it becomes the current file and is automatically operated on by many of the other commands.

Once an activity file has been selected, the other sub-commands under the Select scenario menu become operative. To view the contents of the chosen activity file click on 'Display activity file'. The file may be copied into a text editor using the 'Edit activity file' command. 'Copy activity file' will present a dialogue box to prompt for a new name and then make a duplicate of the activity file. The new file then becomes the current activity file. 'Change harvest level' will perform a global search and replace from one string to another within the currently selected activity file. 'Delete scenario' will delete the currently selected activity file and any related output files. 'Reset info workspace' deletes the info workspace in the current directory.

Caution:	The 'Reset info workspace' command will destroy all data stored in the info subdirectory located in the current workspace. Do not invoke this command in a workspace containing ARC/INFO coverages. Check with your systems adminnistrator if you are uncertain about the meaning of this restriction.

After selecting and modifying one of the activity files, the HSG model can be invoked by choosing the 'Run model' option from within the 'HSG model' menu item. Clicking on this option will cause the model to begin execution, using the currently selected activity file as input. Control will not return to the menu until the model has completed processing the activity file.

After the model has completed execution, results may be viewed using the 'Summary data' option. Selecting this option will cause the system to display a menu listing the data items contained in the summary file. Click on the data items of interest, and then click on the 'Chart' button. A histogram should appear on the screen. Dismiss the histogram by placing the mouse on the border of its window, pressing the right mouse button, and selecting 'QUIT'. Dismiss the 'Summary data' menu by selecting 'Cancel'.

As an example, click on the following buttons: YEAR, area, hrvt, SPECIES, and CHART. (Main data categories are shown in upper case, values within categories are shown in lower case). The chart, displayed as a result shows the area harvested, by year and by species. For a more complicated chart, choose YEAR, SPECIES, area, and AGE. After the chart has been displayed, choose the '3d' option. This will display a three-dimensional perspective chart of age class distribution of the forest over time, broken down by species. In general, the first data category selected will be plotted along the X-axis, the second data category along the Z-axis (if appropriate), and other categories define sub-categories within the histogram and the values to be shown along the Y-axis.

The charting tool can be used to compare the results of one run with another. Click on the CANCEL button to dismiss the summary chart menu. Use the 'Select activity file' menu to choose 'STAGED.ACT' as the currently active activity file. Run the HSG model to generate a summary output file for this parameter set After the model has completed execution, select the 'Summary data' menu. Select a query as before, this time using 'RUN' as the second item in the expression (e.g. YEAR, RUN, volume, avbl, SPECIES). Before choosing 'Chart', select a second summary file by locating the cursor in the 'Comparison file' field and pressing the middle mouse button. When the matrix menu appears, select the 'BASIC.SUM' file as the comparison file. After selecting CHART and clicking the '3d' button, a three dimensional perspective chart of the two runs should appear showing the residual growing stock by species for the two runs of the simulation model.

A more thorough description of the charting tool can be found in the technical report 'Displaying data with the SUBSET and CHART programs' (PNFI, in prep).

Mapping the harvest schedule

The 'Harvest schedule' category provides a number of options for displaying the schedule generated by the model. Make sure that the current activity file produced a schedule file through the use of the HSG 'SCHEDULE' command. The ARCHSG AML's expect the schedule file to have a name of the form *.SCH, where * is the first part of the name used for the activity file. Select the option 'Link schedule' to load the latest results from the HSG model into the ARC/INFO environment in a form suitable for mapping. After the schedule has been linked and control returns to the menu, select either a 25- or 50-year time horizon from the 'Horizon' menu, and then click on the 'Map schedule' option. The results from the HSG model will be drawn upon the screen. All of the 'ROAM' menu options can be used to navigate around the database to examine the harvest schedule. The 'List schedule' option will use the INFO database management system to print a report listing the harvest schedule records for the currently selected polygons. The currently selected polygons are only those visible on the screen, unless the selection list has been modified with the 'Selections' menu.

Mapping the inventory forecast

Inventory forecasts produced with the HSG 'SNAPSHOT' command may be mapped on the screen. To display a forecast map first choose 'Select inventory forecast' from the 'Forecast map' menu item. This will present a dialogue box asking for the name of the forecast file. Press the middle mouse button to display a matrix menu of possible choices. The AML system automatically displays files with a filename extension of '*.snp'. Select a choice using the right mouse button. Once a snapshot file has been selected and linked into the ARC/INFO environment the 'Map inventory forecast' and 'List inventory forecast' options function in a similar manner as those under the 'Harvest schedule' menu.

Stand development curves

Selecting 'Stand development' invokes a program which uses the HSG growth and yield routines to draw out the yield forecast for an individual stand. After selecting this option, point the cursor at a stand polygon and press the left mouse button. A graph will appear on the screen showing the yield forecast for that stand. Note that this forecast is based only on natural development and does not take into account harvest or regeneration activities.

Modifying the harvest schedule

The harvest schedule generated by the HSG model may be edited to adjust the harvest sequence and then used as input to the model, which will then forecast how these changes affect the forest. At set of menu items assist in the editing process. From the 'Mandatory schedule' menu item choose 'Link mandatory file'. This will present a dialogue box requesting the name of the mandatory file to edit. The dialogue box also displays a 'Use schedule file' option. When selected, this option loads a copy of the most recent schedule file as the starting point for creating a mandatory harvest sequence file. After linking the file, the current harvest schedule may be mapped using the 'Map mandatory' option. The 'Edit mandatory' option displays a dialogue box which prompts for a new year of harvest. Enter a value in this field and press return. The harvest date for all of the currently selected polygons will be changed to this new date. Note that the currently selected set may be altered using commands on the 'Selections' menu.

Adjusting the eligibility constraint files

The eligibility constraint files may be viewed and edited though the use of the commands on the 'Blackouts' menu. These commands operate in a similar manner as those on the 'Mandatory schedule' menu. The 'Link mandatory file' command searches for files in the /hsgdir/sample/data directory. The commands to manipulate the eligibility constraint files operate on the starting date and the ending date for each eligibility constraint. After editing the eligibility constraint file, they must be converted into a format suitable for use by the HSG program. Select the 'Convert blackout to constraint' option to perform this conversion.

Problems with INFO

The ARCHSG system may occasionally lose synchronization with the INFO DBMS system. When synchronization is lost many erroneous error messages will be displayed in the ARC text window. To remedy this situation select the 'Reset info workspace' command.

Caution:	The 'Reset info workspace' command will destroy all data stored in the info sub-directory located in the current workspace. Do not invoke this command in a workspace containing ARC/INFO coverages. Check with your systems administrator if you are uncertain about the meaning of this restriction.

Reference

Moore, T.G.E.; Lockwood, C.G. 1990. The HSG wood supply model: description and user's manual. For. Can. Inf. Rep. PI-X-98.

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